Persistent Surveillance

(Global War on Terrorism and Maritime Domain Awareness Scenarios)

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Persistent Surveillance

Persistence and pervasiveness in surveillance is a function of the nature of the targets and the dynamics and scope of the battlespace.

Problem Definition

- Combat Identification / Asymmetric Target Recognition / BDA / Normalcy
- Target domains: Air, Ground, Surface, Sub-surface
- Target types: Fixed, Mobile (moving / stationary),
  Vehicular (mil./ civ.), Human (mil./ civ.), Sources/Links, Support Activities/Links,
- Target relationships: Characteristics, Groups/Units, Behaviors, Dependencies,
  ..
- Highly dispersed forces & tactics
- Space/time advantages to attacker
- De-centralized leadership (local resilient structure)
- Must be close to be effective (feet to miles)?
  - assumes “HE weapon” – No WMD

Threats

Threat Characteristics	Data Needs
• Warfighter indistinguishable from background	- Multi-Sensor, intent, inferencing, normalcy, persistent surveillance, Behavior
• Infrastructure hidden in background	- Multi-sensors, intel, persistent surveillance, inferencing, Intent
• Hard to identify a specific threat type	- Multi-Sensor, persistent surveillance
• Threat uses normalcy for deception	- Multi-sensor, persistent surveillance
• Threat has multiple delivery options	- Multi-Sensor
• Defense has short reaction time	- High Speed – Seconds, forensic surveillance
• Close engagement	- Range – Feet to Miles, forensic surveillance
• Large potential for collateral damage	- Range – Feet to hundreds of feet
• High cost of error – “Decision Criteria”	- Decision criteria
• Uncertain objective function	- Automation of Courses of Action
• Potential impact	- High probability of correct detection, forensic surveillance

Other Techniques to Stimulate Discriminating Responses

- Decoys, honey traps, tags
- Signature enhancements

Managing the Data Deluge

- Sunni triangle
  - Three inch resolution
  - Track all objects traveling up to 60 MPH at 10 ft intervals
  - Leads to 10s of terabits per second which is impossible to handle
  - Fortunately most of this data is irrelevant

- Adaptive persistent surveillance
  - Provide persistent and pervasive surveillance over regions of high probability of significance
  - Use events and entities in the data from the surveillance to smartly adapt the regions of persistent and pervasive surveillance to regions of relevant activity
  - Coordinates and time provide the indexing of the data so as to be able to recall relevant information

Capabilities Needed for Persistent and Pervasive Surveillance

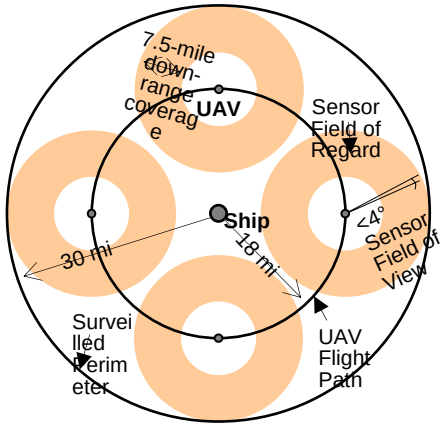
- Large autonomous sensor networks
  - Ability to recognize significant activity and entities
  - Ability to optimally self-task
- Diverse, energy efficient sensors and sensor management
- Automated image and signal analysis
- Automated integration of disparate informaiton
- Variety of platforms for various scenarios

Thrust: Aircraft Carrier Surveillance System

- IR and visible hi-res cameras stabilized to 5 μrad and MIDAS (JSF) sensors demo. Result: CNAL redirected them as IROSS digital replacement.
- NATO SEASPARROW to support MK 57 upgrade.

Thrust: Aircraft Carrier Surveillance System

Recent Major Discoveries/Results



- Detailed system design and analysis revealed graceful degradation to 28 min w/3 UAVs.
- Verified performance with land based measurements.

Fleet/Force implications -CNO Nimitz Strike Group SSC SA